LOW INPUT SUSTAINABLE TURFGRASS MANAGEMENT

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INTRODUCTION

Golf course management is an ever-challenging, evolving process. The process is driven by a variety of factors that seem to change from time to time. As times change, new technologies are developed to adapt to the new management concepts.

Today the new concepts of golf course management are being driven by a number of forces. Two of these forces are our dwindling resources and our need to be environmentally responsible. At the same time there is a higher demand for quality playing surfaces than ever before. The idea that "less is better" has received a lot of attention these days from the green industry in general and many golf course superintendents. However, the demand for quality is not going to go down and may even go higher. The challenge is to keep producing high quality playing surfaces using fewer resources. The major driving force behind pollution and environmental topics is government regulations and public perception. Public relation alone is an important reason to emphasize pollution prevention.

We are all familiar with the term IPM, Integrated Pest Management, or Intelligent Plant Management, if you prefer. I heard of a term used in agriculture called LISA. It stands for, Low Input Sustainable Agriculture. What is the difference? IPM has come to mean in general the growing of turfgrass by proper care and culture to prevent pest and disease problems. The dictionary defines the verb sustain as, "to keep going." I define sustain for our purpose as to "keep going without excess." The characteristics of low input sustainable management provides simultaneous environmental protection. Let's take a look at some of those characteristics.

PLANT SELECTION

Low input management begins with proper plant selection. Select those species or cultivars that can be maintained with the least amount of water, fertilizer, and pesticides. Resist the temptation to grow cool-season grasses in a hot climate and warm-season grasses in a cool-season climate. Do a lot of research on the best adapted turfgrass in your area. Low input works when you have a healthy plant that is not under stress. The healthier the plant is the better it will withstand invasion by all types of parasitic organisms.

Plant breeders continue to work towards producing new and better varieties that are more drought tolerant, use less water, less nitrogen, and are more salt tolerant and better adapted to utilizing waste water. One of the most notable success stories is the new buffalograss varieties developed by Dr. Milton Engelke of Texas A & M and Dr. Terry Rirdon of the University of Nebraska. Improvements of zoysiagrass by several researchers using selective breeding have made this species much more desirable. It shows great promise in reducing nitrogen use and seems to be salt tolerant thus can be used with effluent water in areas where potable water is restricted.

As the need for more and more low input varieties arises, we are bound to see more work by scientists in the area of finding alternative species that require low input to produce an acceptable turf.

Dr. Ken Diesburg of Southern Illinois University is working with a committee to take on the task of identifying turf for low input situations. He is looking at providing acceptable uniformity for low-management course roughs, right-of-way acreage, and parks and recreation. His work is to look at buffalograss, sheep fescue, tall fescue, colonial bentgrass, redtop, Kentucky bluegrass, hard fescue, and zoysia and assess their requirements for establishment and maintenance. These types of alternative grasses are a long way from replacing the quality turf that is required to provide fine playing conditions. While waiting for these grasses to be improved we must still work at producing our current high quality turfgrasses with fewer inputs.

WATER USE

Use only enough water to sustain the health and vigor of the turf. Over-watering leads to many problems with nutrient uptake, fungus diseases, and shallow rooting. Too much water can block or reduce the

soil atmosphere. This will cause the aerobic biological system to become unbalanced in relationship with the anaerobic system. To refrain from over-watering will encourage good soil structure and a healthy aerobic system. Treated sewage, or effluent water should be used whenever possible. Golf courses have been found to be a good treatment site for effluent water.

SOIL ORGANIC MATTER

John Doyle, turfgrass specialist of the Ringer Corporation, in his excellent article "Soil Amendments and Biological Control" *Golf Course Management* March, 1991 makes several excellent statements. Among them: "Changes in disease severity can be distinctly followed as soil types change from sandy to clay loam." He states that increase in organic matter decreases disease occurrence. He concludes the article: "There are materials now available that can be effectively incorporated into a management program that can reduce fungicide application frequency or enhance the effectiveness of existing fungicide programs."

It is clear from last year's turf show and from the number of organic salesmen that are calling on me that there is plenty to choose from in companies selling humus and humic acid materials. Many claims are being made. Only you can evaluate them in your program. Keep an open mind.

SOIL REQUIREMENTS

Keep the soil pH near neutral as some nutrients will not uptake under alkaline conditions and others will not uptake under acidic conditions. Work on your soil structure with many aerations. Compacted soil demonstrates the following: 1. Reduced water penetration, 2. Reduced water holding capacity, 3. Reduced root growth, 4. Low Oxygen levels, 5. Reduced nutrient uptake, 6. Increased chemical build-up, 7. Reduced fertilizer efficiency, and 8. Loss of organic matter.

Compacted or wet soils are low in oxygen and produce anaerobic systems. Anaerobic systems do not break the lignin in the soil to humus. Anaerobic systems produce harmful chemicals to the soil and plant environment, among those chemicals are butanol, methanol, formaldehyde, cyanide, and acetic acid. Anaerobic systems encourage soil borne diseases and soil pests. A productive soil that has not been compacted nor waterlogged produces aerobic microorganisms that make nutrients available to the turfgrass. Therefore, the plant can sustain without the presence of large quantities of fertilizer, which can be expensive and may wind up in the environment.

NUTRITIONAL NEEDS

Low Input Management calls for both soil testing and plant tissue analysis. Not always do the ratios of nutrients in the soil tests correspond to the ratio in the tissue analysis. Soils are tested for available nutrients. The only way to tell for sure if it is available to your turf under you particular set of circumstances is to tissue test. For example: Soil tests may show an adequate phosphate level in the soil test but the tissue test may show inadequate phosphate level in the tissue. The low test could be due to wet soils or soil low in pH. Excessive nitrogen in the tissue can affect the uptake of potassium, sulfur, magnesium, and calcium. Often these nutrients can become more available simply by reducing the nitrogen in the tissue. You cannot tell the nitrogen level of the tissue from a soil test.

Low Input Management calls for the application of only those nutrients that the tests show are needed. For example, if your tissue test showed you deficient in potassium, then potassium only needs to be applied to the turf. Do not use a full mixed analysis fertilizer to cure a single nutrient problem. With the advent of Near Infrared reflected light tissue testing machines coupled with a computer, a superintendent can do his own tissue testing in his own shop, or he can select a good laboratory to do his work on a regular basis.

Recently more and more foliar formulations of nutrients are showing up at our trade shows and in the media advertising. Foliar sprays have a rightful place with Low Input Management. Not only can all plants absorb nutrients through the roots, but also through the foliage. Foliar can produce quick, visible results and can increase the effectiveness of fertilizer applications to the soil, reducing total amounts of fertilizer applied.

Years ago Dr. H. B. Tukey of Michigan State University tested foliar applications of nutrients, in an attempt to evaluate the relative efficiency of foliar applications of nutrients and soil applications using radio-isotopes as tracers in the nutrients. He concluded: "When we apply material to the leaves in soluble forms, as much as 95% of what is applied may be used by the plant. If we apply similar amounts to the soil, we find only

about 10% of it used by the plant."

Foliar nutrients have a place in turfgrass management. It seems to be very popular in the southwest desert regions in the winter. In the winter when golf is in peak season, growth can be limited by cool night temperatures. The cool nights limit the uptake of nutrients from the soil and foliars are very efficient. In Florida, many superintendents also inject foliars through the irrigation system.

We need more research on turfgrass to correlate tissue levels and concentrations of nutrients with plant health. Is it possible to correct turfgrass disease by certain nutritional concentrations? Consider this: 1. Black-heart in celery is prevented by calcium sprays, 2. Rosette of peaches is prevented by foliar zinc solutions, 3. Foliar applications of urea improve fruit set of apples, 4. Magnesium sprays help with fruit development in tomatoes, 5. We know that potassium can aid in disease resistance in many species of plants, and 6. Silica sprays are used by rice farmers in the South to prevent lodging.

Dr. Robert Ellsworth of Bio Huma Netic Corp. in Chandler, AZ has been experimenting with varying ratios of all nutrients in plant tissue. He finds the healthiest grass when he achieves the ratio of 10N-1P-8K-3Ca-1Mg-1S with all minors present at their optimum levels in parts per million.

If you find from tissue testing that you like your greens at 4%N, then your analysis should show 0.4%P, 3.2%K, 1.2%Ca, 0.4%Mg, and 0.4%S. Ellsworth states the calcium is the hardest one to get to those levels but combined with proper potassium is the essential one in increasing resistance to disease. He also finds that silica, although not an essential element, increases the strength and rigidity of the plant cell, tends to reduce wilt during initial stages of drought, and increases resistance to some diseases.

All it takes to get started on the path to using less is to look at your program to see where you can begin to cut back. It may be pesticides, water, or fertilizer. It may be all three. See how far you can go without reducing your desired quality. Soil and tissue tests are the maps to show you how to get started. Cut your water use a little at a time to find the minimums you need to produce the quality you desire. Look at finding ways to sample pest populations and pick a level that is the maximum threshold you can live with. Consider getting off preventive programs and on to knowledge-based curative programs. You will find economical benefits as well as environmental rewards.

I am convinced that reducing usage of nearly everything we apply to our turf will be widely used in the decade before us. That means improved efficiency in every aspect. It also means new researchers with fresh ideas will come forward to meet the challenge. That challenge is to keep producing the expected flawless golf course — using less.